CLAIMS

1. Polar polyolefines produced by a continuous reactive process at molten phase comprising
   a. unsaturated acid or any of its derivatives ranging from 0 to 5% of formula;
   b. free radical initiator comprised of one or more peroxides having $T_{½}$ of 1 min. at temperatures higher than 135°C, ranging from 0.01 to 1% of formula;
   c. unsaturated co-monomer selected from one or more of the group of mono-, di- or poly acrylate or methacrylate esters of short polyol, polyester or polyurethane, or any mixture thereof, ranging from 0.2 to 5% of formula; and,
   d. low melting resin tackifier, ranging from 0.5 to 5% of formula.
2. The polar polyolefines according to claim 1, wherein the unsaturated acid or any of its derivatives are selected from one or more of the group of maleic acid, esters and anhydride; acrylic acid, esters and anhydride; methacrylic acid, esters and anhydride or any mixture thereof.
3. The polar polyolefines according to claim 1, wherein the level of the unsaturated acid or any of its derivatives ranges from 0.5 to 1.8% of formula.
4. The polar polyolefines according to claim 1, wherein the free radical initiator comprises a mixture of two or more organic peroxides that have both $T_{½}$ of 1 min at temperature not less than 135°C, and 10°C to 20°C degrees difference in $T_{½}$ of 1 min between each.
5. The polar polyolefines according to claim 4, wherein the total amount of the peroxide is in the range of 0.01 to 0.5% of formula.
6. The polar polyolefines according to claim 4, comprising a mixture of a first and a second organic peroxide; the first peroxide is characterized by a $T_{½}$ of 1 min at 180°C and a second peroxide is characterized by a $T_{½}$ of 1 min at 195°C.
7. The polar polyolefines according to claim 1, wherein the unsaturated co-monomer is of the formula of R1;R2;R3(R4,R5); wherein R1 is an acrylic or methacrylic group, chemically connected to R2 *via* an ester group; wherein R2 is a mono, di- or polyether chain, connected to R3 *via* either ester or ether group, or *via* wherein R2 is either a short polyester or polyurethane; wherein R3 has a plurality of n acrylate or methacrylate ester side groups, denoted as R4, connected to R3 *via* an ester group, wherein n is an integer number and $n \geq 0$; and further wherein R5 is H, OH, CH_3, high

acid number copolymer, glycidyl, acrylate or methacrylate ester, connected to R3 *via* an ester group.

8. The polar polyolefines according to claim 7, wherein excluding the unsaturated acid or any of its derivatives, the level of the unsaturated co-monomer ranges from 1.8 to 5% of formula; and the level of high acid number acrylate or methacrylated ranges from 0.5 to 1.5% respectively.

9. The polar polyolefines according to claim 7, wherein the sum of all mono and higher acrylate or methacrylate monomers ranges from 0.02 to 5% of formula.

10. The polar polyolefines according to claim 7, wherein the sum of all mono and higher acrylate or methacrylate monomers ranges from 0.03 to 1.5% of formula.

11. The polar polyolefines according to claim 1, wherein the low melting point resin is selected from group of rosin and rosin derivative; phenolic tackifier; polyterpene tackifier, aromatic C_5 or C_9, low molecular weight polyester and polyamide or any mixture thereof; and wherein the level of the resin ranges from 0.5 to 5% of formula.

12. The polar polyolefines according to claim 11, wherein the low melting point resin ranges from 0.75 to 2% of formula.

13. The polyolefin resin according to claim 1, characterized by a modified backbone, selected from at least one of the groups of polypropylene or any copolymer thereof; polyethylene or copolymer thereof, ethylene-propylene-diene monomer elastomer (EPDM) or ethylene-propylene rubber (EPR); ethylen-vinylacetate (EVA); Metallocene catalyzed plastomers; ethylene-vinylalcohol (EVOH) or any copolymer thereof.

14. The polyolefin resin according to claim 13, wherein the level of the resin ranges from 80 to 99% of formula,

15. A polyolefin coupling agent according to claim 1, adapted to couple polyolefines with fillers and fibers.

16. The polyolefin coupling agent according to claim 18, comprising 0.01 to 1% organo-metallic compounds selected from vinyl silane, vinyl containing titanate or zirconates or any mixture thereof.

17. An adhesive or adhesive building-block polyolefin according to claim 1, adapted to adhere to plastics with polar substrates selected from wood, paper, metals, polar plastics, glass, ceramics or any mixture thereof.

18. An adhesive with improved thermal stability according to claim 1, adapted to increase the thermal stability of maleated polyolefines; comprising 0.01 to 2% in the formula of the polyamide resin.

19. A compatibilizer additive according to claim 1, adapted to compatibilize between incompatible thermoplastics and other combinations of nonpolar polymers and polar polymers.

20. A dispersing agent polyolefin according to claim 1, useful in pigments and nano particles in thermoplastic matrices; comprising 0.01 to 1% organo-metallic compounds selected from vinyl silane, vinyl containing titanate or zirconates or any mixture thereof.

21. A primer according to claim 1, useful for coatings and adhesives when applied onto plastic or natural polymers surfaces prior to application of coating or adhesive.

22. The polyolefin resin according to claim 1, wherein the olefin is polypropylene or any of its copolymer; wherein the acrylate monomer has more than two vinyl groups; so a controlled branching and cross linking compensate the chain scission during grafting, improved dimensional stability, mechanical properties and better chemical resistance are obtained.

23. The polyolefin resin according to claim 7, wherein the acrylate is a blend additionally comprising high acid number acrylate or methacrylated co-monomer, so MA content in the starting formulation is reduced to a level from 0 to 50% of those required in a regular process for a similar acid number, and the MFI is better controlled at a range of 10 to 200 at 230°C/2.16 kg.

24. A compatibilized polyolefin alloy according to claim 1; wherein two incompatible olefins are co-modified simultaneously in a reactive extruder; wherein an acrylate or methacrylate co-monomer that has more than two vinyl groups is included at a level of 0.2 to 2%.

25. A continuous reactive process for producing polar polyolefines at molten phase in an extruder, comprising *inter alia* the steps of:
    a. pre-mixing all ingredients so that homogeneous dry, free flowing pellets or powder blend are obtained and so that the liquid co-monomer immobilizes the maleic anhydride dust to the polymer pellets or a powder;

b. feeding the obtained free flowing mixture by standard feeding means into the extruder, in such a manner that the first zone of extruder is heated from 50 to 130°C so the tackifier is instantly melted, and the monomers and the peroxides on the polymer pellets or powder are evenly distributed; and then,

c. reacting the ingredients under extensive mixing in the extruder at 160 to 235°C, residence time of 0.5 to 3 minutes, screw speed 100 to 450 RPM while venting volatile materials under vacuum at the last section of extruder and collecting the reacted product as palletized compound.

26. The process according to claim 25, characterized by a low maleic anhydride sublimation level ranging from 1 to 10% of original blend, and grafting yield of 50 to 80% of original blend.

27. The process according to claim 25, characterized by low gel formation in PE and in any of its copolymers, as evident by a smaller number of gel particles per unit length of product, and by a lower level of gel deposit on screws.

28. The process according to claim 25, enabling a high degree of polarity grafted onto PP and its copolymer with minimal degradation of Melt flow rate, of about 0.1 to 0.8 of the MFI of same process without the novel composition.

29. The process according to claim 25, enabling simultaneously compatibilization and grafting of two or more polyolefines to form a modified alloy.

30. The process according to claim 25, enabling higher levels of acid number *via* the novel acrylate or methacrylate co-monomer that carries acid moieties.

31. The process according to claim 25, enabling a similar level of polarity with 0 to 70% of maleic anhydride required compared to standard maleation process.

32. The process according to claim 25, enabling low odor and low yellowness, wherein yellow index less than 35, modified polyolefines

33. The process according to claim 25, wherein the pre-mixing is provided by means selected from ribbon, planetary or paddle mixer and is batch or continuous.

34. The process according to claim 25, wherein the reactor is a co-rotating twin-screw, counter rotating twin screw, single screw extruder or other extruder suitable for extensive mixing of the molten mixture at with residence time of more than 75 seconds and RPM higher than 200.

35. The process according to claim 25, wherein the feeding step comprises feeding the obtained mixture into the feeding inlet of a continuous reactive reactor; wherein the first section of the extruder is held at temperature of 50 to 130°C to enable melting of the low melting tackifier, mixing of all monomers and initiator without triggering the reaction, and the molten tackifier also seals the gap between barrel and screws so air is avoided and maleic anhydride can not evaporate back from feeding port.

36. The process according to claim 25, wherein the reaction of the molten mixture is carried under extensive mixing at temperature of 160°C to 235°C, residence time of 0.5 to 3 minutes, screw speed 100 to 450 RPM, with venting of volatile materials under vacuum at the last section of extruder and collection the reacted product as palletized compound.

37. The continuous reactive process for producing polar polyolefines at molten phase as defined in claim 25 or in any of its dependent claims, adapted to produce polar polyolefines comprising: unsaturated acid or any of its derivatives ranging from 0 to 5% of formula; free radical initiator comprised of one or more peroxide having $T_{½}$ of 1 min. at temperature higher than 135°C, ranging from 0.01 to 1% of formula; unsaturated co-monomer selected from one or more of the group of mono-, di- or poly acrylate or methacrylate esters of short polyol, polyester or polyurethane, or any mixture thereof, ranging from 0.2 to 5% of formula; Polyolefin resin or mixture of more than one polyolefin resin, ranging from 80 to 99% of formula. and a tackifier ranging from 0.5 to 5% of formula.

38. A continuous reactive process for producing polar polyolefines at molten phase in an extruder, comprising *inter alia* the steps of pre-mixing all ingredients so homogeneous dry, free flowing pellets or powder blend are obtained; immobilizing the maleic anhydride dust to the polymer pellets or powder by means of the liquid monomer; feeding the obtained free flowing mixture by standard feeding means into the extruder (usually co-rotating twin screw), in such a manner that the first zone of the extruder is heated from 50 to 130°C so the tackifier is instantly melted, and the monomers and the peroxides on the polymer pellets or powder are evenly distributed; and then reacting the ingredients under extensive mixing in the extruder at 160 to 235°C, residence time of 0.5 to 3 minutes, screw speed 100 to 450 RPM while venting volatile materials under vacuum at the last section of extruder and collecting the reacted product as palletized

compound; so that polar polyolefines as defined in claim 1 or in any of its dependent claims are produced.